OUTDOOR AIR POLLUTION AND SOCIAL STRESSORS ACROSS NYC COMMUNITIES: A GIS-BASED SPATIAL CORRELATION STUDY OF MULTIPLE EXPOSURES IN THE URBAN ENVIRONMENT

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Background and Aims: Chronic psychological stress has been linked to respiratory health, both independently and in combination with air pollution. Geographically patterned community-level social stressors (e.g., noise, violence) may impact upon individual psychological stress. Here, we address methodological challenges in characterizing spatial correlations among community stressors, and in interpreting publicly available data collected at different administrative areas. We then validate the utility of community-level stressor indices to explain differences in individual-level stress, enabling a meaningful exploration of synergistic effects of social and environmental exposures on urban health.

Methods:Building on the New York City Community Air Survey (NYCCAS), a year-round study of intra-urban variation in air pollutants, we use GIS-based methods to explore spatial correlation among community-level stressors (e.g. violent crime, noise annoyance, mental health, poverty, quality of life, childhood stressors), and with air pollution. We employ simultaneous autoregressive (SAR) modelling, leveraging spatial autocorrelation within indicators, to assess correlations among exposures, and developed a novel GIS-based method for comparison among incongruent administrative areas. Tests for sensitivity to unit of aggregation were conducted using high-resolution air pollution and census data.

Results: Using GIS-based spatial analysis, we identified spatial autocorrelation and inter-neighborhood variability in all covariates. Preliminary analyses showed that stressor and air pollution exposures were not uniformly correlated across the city. Leveraging autocorrelation revealed inconsistent influence on observed associations among these community-level exposures.

Conclusions:Our analyses suggest that community stressors are not consistently spatially correlated with neighbourhood poverty or air pollution. These spatial discrepancies enable examination of independent and synergistic effects on health, and characterization of potential differential air pollution impacts on susceptible communities. Unmeasured spatial confounding and autocorrelation may bias epidemiologic findings on multiple exposures. Next steps include participatory GIS to validate neighborhood boundaries, focus groups to identify important community-level stressors, and surveys to assess the relevance of community stressors in explaining individual-level stress.